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ABSTRACT

These aspects of the 1970-71 implementation program for a system-wide elementary school science program are discussed: selection of the elementary science textbook adoption committee and an outline of the committee's responsibilities; review of materials by the selection committee, including a list of general strengths and weaknesses of four textbook series and a list of general strengths and weaknesses of the two process-oriented programs examined (Elementary Science Study (ESS) and Science - A Process Approach); a list of 12 rationale statements expressing why ESS was preferable; implementation, including selection of materials and development of an in-service program; a cooperative school-university workshop designed to develop teacher competencies in inquiry techniques, writing objectives behaviorally, identifying and using process skills, and gaining proficiency with ESS materials; a general evaluation of the first year (1971-72); and recommendations based on the experiences with the implementation program. The appendix includes the evaluation form used for elementary science textbooks or programs, a summary of the evaluation of each textbook or course examined, and the content of the university workshop. (PR)

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A STUDY OF THE IMPLEMENTATION OF THE ELEMENTARY SCIENCE STUDY PROGRAM ON A SYSTEM-WIDE BASIS IN THE PENN-HARRIS-MADISON SCHOOLS*

by

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The emphasis on teaching science as an immutable body of knowledge has been supplanted by the notion that it ought to include the processes of acquiring knowledge. With this reflecting our philosophy, it became our task to select and implement a science program consistent with this position.

The implementation of any program passes through a number of preliminary stages. In the case of the Penn-Harris-Madison School Corporation, initial impetus was provided by the Indiana State Department of Public Instruction. Policy established by the State Department stated that adoption of science programs implemented by all public schools

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in Indiana during the school year commencing in September 1971 was to be accomplished during the 1970-71 school year.

Within the corporation, it was the responsibility of the Director of Elementary Education to create a committee charged with the responsibility of recommending to the Board of School Trustees a science program to be adopted.

The underlying concern in creating such a committee was the identification and selection of a teacher who would coordinate the activities of this committee. The Director sought the assistance of the elementary principals in selecting a teacher who could provide expertise in elementary science education as well as leadership ability.

These teachers were then interviewed by the Director of Elementary Education and one was selected to serve in the capacity of Coordinator of the Elementary Science Textbook Adoption Committee (ESTAC).

SELECTION OF THE ELEMENTARY SCIENCE TEXTBOOK ADOPTION COMMITTEE (ESTAC)

Following selection of the coordinator, selection of ESTAC members was undertaken. All interested teachers were interviewed by building principals and selected recommendations were then given to the Director. These teachers were then interviewed by the Director and the Coordinator. Through this process, 19 teachers were selected to serve on the ESTAC.

It was decided at the outset that expediency necessitated

the formation of two sub-committees within the major ESTAC group. One of these was a sub-committee composed of primary grade level teachers and the other composed of intermediate level teachers. Each group in turn selected a chairman to direct the activities of the two sub-committees.

The final composition of the ESTAC consisted of the Director of Elementary Education, the ESTAC Coordinator, the Primary and Intermediate Sub-committee Chairman, the Teachers comprising the primary and Intermediate Sub-committees, and an elementary principal assigned by the Director to advise each group.

ESTAC was charged at an initial organizational meeting with the responsibility to:

1. Review all text materials selected by the State Department of Public Instruction for adoption as to;

   a. readability levels,
   b. appropriate scientific content,
   c. adaptability to the P-H-M science curriculum guidelines,
   d. relevancy to the grade level at which it is to be taught,
   e. emphasis upon experimental and investigatory techniques.

2. Review the AAAS, SCIS, and ESS programs and materials in the same manner;

3. Recommend to the Board of School Trustees adoption of science materials to serve the needs of the students for the school years 1971 through 1976.

REVIEW OF MATERIALS BY ESTAC

The ESTAC's first major goal was to review the volumes of materials that were in need of evaluation. These materials included the seven textbook series on the approved list of the State Department of Public Instruction's Textbook Adoption Commission as well as the "process" programs available for teaching elementary science.

The current philosophy of the school system indicated that emphasis on the teaching of science be placed upon experimentation, investigation, and inquiry as the primary objectives of any program or textbook series adopted. A cursery review of the materials indicated that two of the approved series had undergone no substantial revisions from the previous adoption and were not consistent with this philosophy. A third series examined did undergo substantive changes which brought it closer to this philosophy, however, teacher editions were not available from the publishers thus making the series incomplete.

These three series therefore were not considered by ESTAC, thus reducing the number of textbook series to be thoroughly evaluated to four. At the same time, it was determined that only the AAAS and ESS programs would be considered as alternatives to the textbook approach as sufficient materials could not be obtained to adequately evaluate the other "process" programs available.

Letters were sent to the publishers of each of the

textbook series to be examined requesting that materials, including supplementary, be sent to the chairmen of both the primary and intermediate sub-committees. The chairmen were asked to distribute these materials to the members of their committees for evaluation.

Workshops were arranged with and conducted by representatives of the publishers of the AAAS and ESS programs. Samples of their materials were also made available for review and evaluation.

Each committee member was asked to examine and evaluate materials designated for use at his grade level. Final evaluation and selection was to be based upon results of the "Elementary Science Textbook Evaluation Tally Form" (See Appendix) and the appropriately applied readability formula. Committee members evaluating primary level materials were to apply the Spache Readability Formula[1] and intermediate levels were to apply the Dale-Cahll Readability Formula[2].

As the evaluations submitted by the committee were being compiled, it became apparent that both the primary and intermediate sub-committees identified the process oriented programs as having fewer weaknesses and greater strengths in light of the philosophy of the Penn-Harris-Madison schools.

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[1]Spache, G.D., "A New Readability Formula for Primary Grade Reading Materials," Elementary School Journal, 53:410, March, 1953.

[2]Dale, Edgar and Chall, Jeanne S., "A Formula For Predicting Readability," Columbus, Ohio: The Ohio State University Bureau of Educational Research. Reprinted from Educational Research Bulletin, 27: pp. 1-7.

In general, the strengths identified by the two sub-committees for the textbook series examined were*:

1. Most met needs of average of above-average learners in terms of ability to comprehend materials presented;

2. Sufficient enrichment activities for above-average learners were provided;

3. Primary level materials were adequately supplemented by audio-visual materials;

4. Supplementary materials in the form of kits, workbooks, and evaluative instruments were provided for most intermediate level textbooks;

5. All had functional Teacher Editions providing an adequate format for convenient and effective use;

6. Teacher Editions provided sufficient follow-up and enrichment exercises.

In general, weaknesses identified were*:

1. Most failed to meet the needs of the slow-learner or below-average reader;

2. Most were not readily adaptable to non-graded continuous progress programs or to individualized instruction. Units presented in a given text were not considered appropriate for other grade levels;

3. Readability levels were usually above the grade level for which the text was intended. Most intermediate texts were from 1 to 2.5 grade levels above intended useage;

4. Most experiments and investigations were close-ended rather than open-ended, thus inquiry was terminated at the conclusion of the exercises.

In general the strengths reported for the two process oriented programs examined were*:

1. Both emphasized process as opposed to content as the method of instruction. This was done without neglecting the value of content in science teaching:

2. Open-ended inquiry investigations were the basis of the instructional approach;

3. Both programs were especially adapted to allow for individual differences among students;

4. Teacher guides provide suggestions for activities designed to meet the needs of slow, average, and above-average learners;

5. Both programs required a minimum of reading competency thus not imposing unwarranted penalties on the underachiever or lower-ability students.

In general, weaknesses reported were*:

1. Both programs show a lack of sufficient A-V materials to supplement the activities;

2. Both programs require a strong in-service program to provide teachers with skills necessary to effectively use inquiry as an approach to teaching;

3. Both programs are extremely expensive to implement and maintain as compared to textbooks.

RECOMMENDATIONS FOR ADOPTION BY ESTAC

The two sub-committees, having reviewed the materials, met as a committee of the whole at the conclusion of their separate examinations. This was done so that specific recommendations for adoption of science materials could be drawn and to vote on the particular text or program which was felt would best meet the needs of students while remaining consistent with corporation philosophies, policies, and goals.

As a result of this meeting of the Elementary Science Textbook Adoption Committee, it was recommended that the Elementary Science Study Program be adopted by the Board of School Trustees. The following specific rationale was provided by ESTAC:

1. ESS offers continuous progress approach for students consistent with the non-graded approach being utilized in some corporation schools as well as with the more traditional grade-level approaches being used by others;

2. Opportunities for individualized instruction are provided throughout the program;

3. The program recognizes and provides activities for differing levels of ability;

4. Reading difficulties encountered by students would not deter scientific investigations;

5. The intention of the ESS program is to enrich every student's understanding of science through emphasis upon what scientists do and how they do it;

6. ESS investigations emphasize understanding arrived at through scientific problem-solving techniques;

7. ESS programs consist of a number of differing units of study each of which may be used for varying time periods and on different grade levels, thus allowing for flexibility in scheduling and usage;

8. ESS relies heavily upon inquiry and process as methods for presenting scientific investigations as well as providing an abundance of open-ended experiments emphasizing student involvement in the processes of science;

9. Each unit is accompanied by a separate Teacher's Guide designed to furnish text material-resource, supplementary, and background information and investigatrory procedures;

10. ESS Teacher Guides provide suggested models for teaching the particular processes to be learned, however, the models presented are not designed to be requirements;

11. Teacher Guides provide illustrations, sample worksheets, experiments, descriptions of suggested materials and uses, additional and enrichment activities, and scheduling suggestions;

12. ESS provides units leading to investigations in biological, physical, earth and general sciences with a sound balance between intra- and inter-disciplinary investigations.

The Penn-Harris-Madison School Corporation Board of School Trustees formally adopted the Elementary Science Study Program on April 28, 1971. The program was to be formally implemented in all elementary classrooms in September 1971 for the specified adoption period.

IMPLEMENTATION OF THE ELEMENTARY SCIENCE STUDY

Informal implementation actually began in April 1971 with the formal adoption of the program by the School Board. This preliminary implementation consisted of selecting the ESS units which would make up the P-H-M Science Program and then placing each unit within a particular grade level. To accomplish this, the Director of Elementary Education requested the Elementary Science Coordinator to develop a curriculum outline.

While the guidelines were being developed, the units were again examined in detail. Units offering maximum program flexibility were chosen within the fund limitations of each school. As available textbook fee monies were determined

by enrollment within each building, the ordering of materials involved much time and coordinated effort between the coordinator and building principals.

At this point, with purchase orders almost finalized, the Director of Elementary Education received notification from the publishers that a prince increase had gone into effect. A review of the suggested implementation of ESS units showed that the cost of this original program was excessively prohibitive, even though textbook fees had been raised to accommodate the new program.

Revision of the proposed program thus became necessary. Some units of highest cost factor were dropped and lower cost units substituted. In many cases, suggested grade level placement of units were changed to accommodate larger enrollments. The most notable changes, however, occurred within the disciplines to be covered. Wherever practical, physical science units, high in cost factor, were dropped and units in the general or biological sciences having no kits or low cost factors were substituted. Thus, investigations in the physical sciences are somewhat lacking. However, the general science units are easily adapted to encompass these investigations.

With the opening of school in September, most buildings had all of the materials which had been ordered for them. Those missing were back-ordered and presented no particular problem other than the usual nervousness suffered by elementary

teachers when any materials are missing which they will need. However, the problems arising out of the In-service program made implementation very spotty, especially in the primary grades.

DEVELOPMENT OF IN-SERVICE PROGRAM

In-service training of teachers to implement the ESS program was to be provided both by the publishers and by the school corporation. The publishers were to provide intensive workshop-type programs to selected teachers within the corporation conducted by trained consultants.

These select teachers, eight in all, were to return to their respective buildings and provide in-service training to key people at each grade level. These key people were, in turn, to act as a nucleus for total implementation.

Finally, the publishers were to provide, commencing in October, consultant service to the teachers involved on a regularly scheduled basis to assist as deemed necessary in the implementation of the ESS program.

Problems arose almost immediately. The intensive training program was postponed four different times in June and July. The teachers involved had to continually reschedule their own commitments for the summer. Finally, on August 11, the publishers notified the Director of Elementary Education that the intensive workshop would be held the following week in Gary, Indiana. By this time, however, only four teachers

were available to attend.

The workshop was excellent in so far as it familiarized those present with all the units then available in the ESS repertoire. It also provided practical experience in the presentation of specific units as each participant was required to develop and present a lesson from a unit of his choice. However, it was strongly felt that sufficient evaluative instruments and support for developing them was missing. Indeed, it was recommended that formal evaluation of student progress should not be undertaken.

The in-service provided by the P-H-M science coordinator had strongly stressed the development and use of specific instructional and performance objectives both as teaching techniques and as evaluative instruments for each ESS unit to be taught. Indeed, it was one of the aims for 1971-72 school year to develop a complete program of such objectives for all teachers using the ESS materials.

However, the ESS consultant strongly discouraged the use of performance objectives when working with children in classroom situations. As it was not possible to obtain what was felt to be a sufficient rationale from the consultant to discontinue, it was decided by the P-H-M participants to continue developing performance-based objectives. The rationale for the continuation of this pursuit on our part seemed quite clear.

In developing our science program, it was felt that the continued revision and development was contingent on the

examination of the effects of instruction. It was therefore necessary to identify those behaviors the program was supposed to produce. Further, it was felt that without explicit objectives, our science program would not progress beyond the first tryout.

We decided that perhaps the best measure of the effectiveness of our program would be student performance on our objectives.

Still another reason for using a behavioral approach was provided by our desire to individualize instruction. By providing students with the behavioral objectives for each unit, we provided a clear communication of our minimal expectations of instruction to the learner.

As we progress, we further hope to individualize instruction by:

1. pretesting the learner with respect to our goals thereby starting each student with the goals he is unable to achieve;

2. arranging a variety of options from which he can chose his learning experiences to achieve the objectives.

At the conclusion of the workshop, it became apparent that these four teachers were not sufficient, within regular school time, to train the key people in each building of which there were 4 intermediate (4-6), 5 primary (1-3), and one elementary (1-6). It was decided, therefore, that the four participants in the workshop would train the key people in the building to which they were assigned. Also, each would train the teachers in the intermediate or primary building in their elementary complex. The Elementary Science Coordinator would then receive additonal release time to work with the

key people in the remaining buildings for one full day each during the third week of school and for 1/2 day at a later time on a need basis.

A further problem arose over the provision of consultant services to be provided by the publishers. Originally, the publishers had agreed to provide consultants on a regular basis as the need arose beginning in October. While the need was certainly there, no consultants were forthcoming nor was it possible to establish adequate contact with the company's representative. When contact was finally made, it was learned that a consultant would not be available until January. He finally appeared and spent two days consulting with teachers at six of the ten buildings involved in the program. Again, his major point of emphasis was that formal evaluation of student progress was unnecessary and the developemnt of performance-based objectives unwarranted. This also created problems as there were a number of teachers who had expressed resentment over or lack of understnading of performance objectives.

At this point, it is unclear if further consultant services will be forthcoming, although the need is still there. The consultant did perform valuable service in presenting specific suggestions about introducing and presenting some of the more complex ESS units.

In-service training also involved identification of the process skills to be taught at each grade level and

selection of specific ESS units which would provide such skills at the appropriate level. This was done both through the curriculum guide, and it was hoped, through the ESS workshops and consultant services. ESS, however, provided little assistance in helping teachers understand or implement the process skills.

To overcome this crucial problem, it was decided by the Director of Elementary Education to develop with the cooperation of Indiana University at South Bend a graduate level course which would be offered to P-H-M teachers to provide these skills.

COOPERATIVE SCHOOL - UNIVERSITY WORKSHOP

This course of study was designed to encompass a number of activities which were felt by P-H-M and Indiana University to be desireable for competency with any of the process-oriented approaches to science teaching. It was also determined that emphasis throughout would be placed upon ESS materials, in particular. Thus, the course-work was specifically designed to develop teacher competencies in inquiry techniques, writing objectives behaviorally, identifying and using the process skills, and gaining proficiency with ESS materials.

So that continuous feedback between P-H-M and the University might be established and expertise in the ESS program be provided, the Elementary Science Coordinator was hired as Laboratory Assistant to the University Instructor.

Eleven class sessions were scheduled on a weekly basis of 4 hours each during September, October and November. During each session, independent activities were provided in the process skills, inquiry techniques, or objective writing. Beginning with the third session, various ESS units were introduced and the participants were provided opportunity to become involved in the. The last three sessions were devoted exclusively to ESS units with each class member requried to develop and present to the class a lesson from a unit at his grade level. This presentation was to include appropriate performance objectives, identification of specific processes to be taught and activities to perform, and an inquiry session involving other members of the class.

Evaluations submitted by the 23 participants at the conclusion of the course indicate that such a course as a method of familiarizing teachers with process skills, writing objectives, inquiry techniques, and the ESS program has a high degree of value. It would be desireable, however, to present specific methods that can be employed to more adequately evaluate student progress.

Follow-up also indicates that while many of the participants lacked the confidence to implement ESS, as a direct result of this course most now do so.

EVALUATION OF SCIENCE TEACHING - YEAR 1

Implementation of ESS in a school system whose teachers have come to rely upon the textbook approach to the teaching

of science presents a number of problems to be overcome.

First is the problem of competence. This is notably true of primary level teachers, at least in P-H-M. In a survey conducted in September 1971, 29 out of 53 teachers in grades 1 through 3 expressed feelings of imcompetence in the teaching of science. Of the 29, 25 were teachers in grades 1 and 2 and indicated that they taught science only if time allowed. By December, only 9 of these teachers were still teaching science only on a time allows basis. Indeed, most 16 - felt that ESS units made science and science teaching enjoyable for them and their students. Seven of the nine are second grade teachers all teaching in the same building. To overcome the problem in the school, one teacher has taken the sole responsibility for teaching science to the second graders there.

In the intermediate grades (4-6), competence to teach science was not as great factor probably due to departmentalization in this area. However, incompetencies in the process skills and inquiry techniques did manifest themselves. Of 20 science teachers, 8 felt incompetent to introduce the program in September. These teachers all enrolled in the graduate course offering and have since become active supporters of the ESS program.

Seven other intermediate level science teachers expressed misgivings about their ability to deal with the inquiry techniques called for. While all of them implemented

the program, as of February they still felt a lack of confidence in inquiry sessions. None of these teachers participated in the graduate course.

The remaining teachers in the intermediate classes implemented and have strongly supported the ESS program from the start. They have been particularly supportive by providing behavioral objectives and leading inquiry sessions with other teachers in their buildings.

RECOMMENDATIONS

Several recommendations would be in order based upon our experiences with a system-wide implementation program for a "process" program in elementary science.

1. An in-service program should be implemented within the school system to prepare and expose teachers to behavioral objectives, process skills, and inquiry techniques before actual adoption proceedings begin.

2. Firm commitments from publishers should be obtained to insure adequate pre-implementation in-service training.

3. The school system should arrange for one of its teachers to be trained as a consultant within the system who would also direct the implementation of the program in keeping with the philosophy and goals of the system.

4. Opportunities should be made available for feedback and in-service practice to participating teachers.

5. A vertical file should be developed and maintained for making available behavioral objectives produced by the teachers for each process and unit being taught.

6. Cooperative School-University programs should be developed to support teachers in process-oriented programs.

7. Universities should encourage placement of Elementary Methods students in classrooms utilizing these techniques as follow-up.

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APPENDIX

APPENDIX A

Elementary Science Textbook or Program Evaluation

A. The material lends itself to a continuous progress (non-graded) program. (5 points)

B. The material lends itself to individualized instruction. (8 points)

1. Promotes inquiry and thought.
2. Provides scientific problem-solving techniques.
3. Provides for inductive and deductive reasoning.
4. Presents realistic, current problems.
5. Promotes independent and creative thinking.
6. Adapts to different levels of ability.

C. The material is largely non-verbal. (5 points)

1. Readability level appropriate;
   a. Primary level (K-3).
   b. Intermediate level (4-6).
2. Illustrations appropriate to content.

D. Student Involvement. (10)points)

1. In text or program.
2. In figures and diagrams.
3. In questions (inquiry).
4. In summaries (conclusions).
5. In text or program activities (experiments).

E. The material meets the needs of the fast learner. (3 points)

F. The material meets the needs of the average-learner. (3 points)

G. The material meets the needs of the slow-learner. (3 points)

H. The Teacher's Edition format of textbook or program is functional. (3 points)

1. Adequate format for convenient and effective use.
2. Sufficient clarification and background material.
3. Provides aid in methods of presentation and sequencing of instruction.
4. Provides alternate methods of problem-solving and forms of answers.
5. Presents suggestions and materials to aid in diagnosis and remedial work.
6. Provides activities for enrichment at all levels.

I. Supplementary materials are provided for various ability levels of children. (3 points)

J. Provisions are made for In-service for teachers. (5 points)

K. The physical make-up of the textbook or material is adequate for the science textbook adoption period of five (5) years. (3 points)

PENN-HARRIS-MADISON SCHOOL CORPORATION

Elementary Science Textbook Evaluation Tally Grade Level____

This tally form is used for recording your evaluation of the various textbooks or programs surveyed. Note the possible points for each of the eleven (11) major areas. The largest number represents the highest rating possible.

COMPANY	MAJOR AREAS										
	A (5)	B (8)	C (5)	D (10)	E (3)	F (3)	G (3)	H (3)	I (3)	J (5)	K (3)
Macmillan Company											
Charles Merrill											
Holt, Rinehart, Winston											
Harcourt, Brace, Jovanovich											
AAAS											
ESS											

APPENDIX B

Summaries of Each Textbook and Program Examined

Primary Sub-committee Evaluations:

Grade	Publisher	Title	Copyright
1	Macmillan	Science: Observing Things	1970
2	Macmillan	Science: Finding Out	1970
3	Macmillan	Science: Being Curious	1970

Strengths - Excellent supplementary materials
Weaknesses - Lack of continuous program, little student involvement
Readability Level: Grade 1 - 1.9 Grade 2 - 2.4 Grade 3 - 3.2

Grade	Publisher	Title	Copyright
1	Charles Merrill	Discovering Science - 1	1970
2	Charles Merrill	Discovering Science - 2	1970
3	Charles Merrill	Discovering Science - 3	1970

Strengths - Highly usable Teacher's Edition providing background information and extended lesson plans
Weaknesses - Lack of continuous progress, little student involvement, inadequate supplementary materials
Readability Level: Grade 1 - 2.1 Grade 2 - 2.3 Grade 3 - 3.3

Grade	Publisher	Title	Copyright
1	Holt, Rinehart, Winston	Modern Elementary Science 1	1971
2	Holt, Rinehart, Winston	Modern Elementary Science 2	1971
3	Holt, Rinehart, Winston	Modern Elementary Science 3	1971

Strengths - Excellent supplementary program and transparencies
Weaknesses - Lack of continuous progress adaptability, emphasis on content rather than inquiry, little involvement
Readability Level: Grade 1 - 2.1 Grade 2 - 2.6 Grade 3 - 3.3

Grade	Publisher	Title	Copyright
1	Harcourt, Brace, Jovanovich	Concepts in Science, Level 1	1970
2	Harcourt, Brace, Jovanovich	Concepts in Science, Level 2	1970
3	Harcourt, Brace, Jovanovich	Concepts in Science, Level 3	1970

Strengths - Emphasis upon concept development rather than content, best text series attempt at continuous progress, Teacher's Edition establishes performance objectives for all units

Weaknesses - Lack of student involvement, inadequate supplementary materials, highest difficulty of reading of texts examined

Readability Level: Grade 1 - 2.2 Grade 2 - 2.7 Grade 3 - 3.3

Grade	Publisher	Title
1	Xerox Corp.	AAAS - Science: A Process Approach - A
2	Xerox Corp.	AAAS - Science: A Process Approach - A
3	Xerox Corp.	AAAS - Science: A Process Approach - B

Strengths - Emphasis upon open-ended inquiry, performance, and process; designed to show students what scientists do and how they do it

Weaknesses - Implementation at all grade levels on a system-wide basis at one time would be extremely difficult, highly structured hierarchy of learning leaving little room for individualization in actual practice, selectivity of purchase not possible thus making cost prohibitive

Grade	Publisher	Title of Unit
1	Webster Div.	Butterflies
	McGraw-Hill	Primary Balancing
	ESS	Gee Blocks
		Light and Shadows
2	Webster Div.	Growing Seeds
	McGraw-Hill	Eggs and Tadpoles
	ESS	Mobiles
		Clay Boats
		Sand
		Attribute Games and Problems
3	Webster Div.	Life of Beans and Peas
	McGraw-Hill	Brine Shrimp
	ESS	Ice Cubes
		Colored Solutions
		Mystery Powders
		Rocks and Charts
		Mirror Cards

Strengths - Offers continuous progress, usable as determined by teacher, provides for individual differences, reading ability not a determining factor in success of program, highly flexible

Weaknesses - Lack of sufficient supplementary A-V materials, notably filmstrips and transparencies

Intermediate Sub-committee Evaluations:

Grade	Publisher	Title	Copyright
4	Macmillan	Science: Comparing Things	1970
5	Macmillan	Science: Testing Ideas	1970
6	Macmillan	Science: Measuring Things	1970

Strengths - Excellent enrichment activities for fast-learner, adequate supplementary materials
Weaknesses - Fails to meet needs of average and below-average readers, weak Teacher's Edition, poor attempts at student involvement
Readability Level: Grade 4 - 5.3 Grade 5 - 6.5 Grade 6 - 8.5

Grade	Publisher	Title	Copyright
4	Charles Merrill	Discovering Science: 4	1970
5	Charles Merrill	Discovering Science: 5	1970
6	Charles Merrill	Discovering Science: 6	1970

Strengths - Does creditable job of meeting needs of slow-learner through varied experiences
Weaknesses - Fails to provide for individual differences, weak Teacher's Edition, little provision for supplementary materials, physical make-up not adequate for five years
Readability Level: Grade 4 - 5.0 Grade 5 - 6.4 Grade 6 - 8.5

Grade	Publisher	Title	Copyright
4	Holt, Rinehart, Winston	Modern Elementary Science: 4	1971
5	Holt, Rinehart, Winston	Modern Elementary Science: 5	1971
6	Holt, Rinehart, Winston	Modern Elementary Science: 6	1971

Strengths - Provides enriching experiences for fast-learners, much supplemental material
Weaknesses - Little student involvement provided, does not lend itself to individualized instruction, material too advanced for average or below-average readers, Teacher's Edition very poor
Readability Level: Grade 4 - 5.1 Grade 5 - 6.9 Grade 6 - 7.9

Grade	Publisher	Title	Copyright
4	Harcourt, Brace, Jovanovich	Concepts in Science, Level 4	1970
5	Harcourt, Brace, Jovanovich	Concepts in Science, Level 5	1970
6	Harcourt, Brace, Jovanovich	Concepts in Science, Level 6	1970

Strengths - Excellent provisions for average and above-average learners, good supplementary materials, excellent stress on concept development
Weaknesses - Not practical for individualized instruction, student involvement is low, Teacher's Edition unsatisfactory, slow-learner not provided for
Readability Levels: Grade 4 - 5.6 Grade 5 - 6.8 Grade 6 - 9.1

Grade	Publisher	Title
4	Xerox Corp.	AAAS-Science: A Process Approach - B
5	Xerox Corp.	AAAS-Science: A Process Approach - C
6	Xerox Corp.	AAAS-Science: A Process Approach - D

Strengths - Largely nonverbal, emphasizes student involvement, inquiry, and process, adequately meets needs of fast and average learners
Weaknesses - Highly structured sequentially arranges program, difficult to implement, total program must be purchased making cost prohibitive, Teacher Guides weak

Grade	Publisher	Title of Unit
4	Webster Div.	Animals in the Classroom
	McGraw-Hill	Pond Water
	ESS	Budding Twigs
		Bones
		Pendulums
		Tangrams
5	Webster Div.	Animals in the Classroom
	McGraw-Hill	Animal Activities
	ESS	Microgardening - Beginners
		Batteries and Bulbs I
		Senior Balancing
		Where Is the Moon?
		Attribute Games and Problems

Grade	Publisher	Title of Unit
6	Webster Div.	Animals in the Classroom
	McGraw-Hill	Crayfish
	ESS	Microgardening-Advanced
		Small Things
		Behavior of Mealworms
		Batteries and Bulbs II
		Gases and "Airs"
		Peas and Particles
		Kitchen Physics

Strengths - Excellent program for continuous progress, most adaptable to individualized instruction, largely nonverbal, student involvement very high, adequate to meet needs of slow average and fast-learner, numerous hands-on activities

Weaknesses - Lack of adequate A-V materials, notably filmstrips and transparencies

APPENDIX C

School - University Graduate Course of Study

E548 Advanced Methods of Teaching
Elementary School Science

H. James Funk
Fall, 1971

The purpose of E548 is to aid you in acquiring and practicing some of the capabilities required in teaching elementary school science (hence ESS). To achieve this you will practice skills necessary for investigating science problems, read and discuss useful ideas from psychology and teaching methodology, plan a unit of instruction, and other activities.

Texts: Developing Teacher Competencies, Weigand
Systematic Instruction, Popham and Baker
Other reference material will be placed on reserve to be used as dictated be specific assignments.

Office: 138 Riverside Hall

Phones: 287-9090 (home)
307 (office)

Hours: I don't set aside specific office hours. When not in class or supervising student teachers, you can find me in my office. The door is always open. If you wish, you may arrange an appointment.

Course Requirements:
1. Programmed material
2. Reading assignments
3. Process skills unit
4. Occassional written assignments
5. Presentation of instructional unit to peers
6. Teaching children
7. Competency measures
8. Participation in; Class discussion and
science lab activities

Evaluation: Evaluation will be based upon your completion of the course objectives.

Organization: The intention of E548 is to depart from the customary format. The goal is to operate an individualized, performance-based course.

Be prepared for a moderate amount of confusion and last minute changes in plans. Every effort will be made to keep this to a minimum. Availability of materials, etc. will determine how closely we will be able to follow our orginal schedule.

E548 Objectives and Tentative Schedule

1. Science Process Skills. 7 weeks. The specific objectives and materials are available for each of the sixteen units. You will be given in-class time to work on this block of objectives.

   The purpose of the materials in this unit is to aid you in learning what are known as process skills. Examples of process skills are observing, measuring, inferring, and the like. Therefore what you will learn to do is observe, measure, classify, etc. As you proceed through the unit, keep in mind that the skills are these that are applicable to ESS or any other science program (but particularly ESS#1 Feel free to use any of the ideas in the program with your classes. You may wish to adapt some of the lessons to the ESS materials in your unit and lesson presentations.

   The materials and activities in this unit are designed to develop skills in:

   1. Observing
   2. Classifying
   3. Measuring
   4. Communicating
   5. Inferring
   6. Identifying variables
   7. Predicting
   8. Constructing a table of data
   9. Constructing a graph
   10. Acquiring and processing your own data
   11. Describing the relationship between variables
   12. Analyzing investigations
   13. Defining variables operationally
   14. Constructing hypotheses
   15. Designing investigations
   16. Experimenting

   The specific performance objectives and materials are available with each topic. When you finish with an objective or particular set of objectives, you may take the mastery tests. If you are dissatisfied with your score, and wish to take it again you may.

2. Given the ESS equipment for a science activity, you should be able to demonstrate the necessary psychometer skills to complete the activity. (continuous)

3. Given the considerations for developing a philosophy of science, you should be able to express your philosophy of science in 100 - 200 words.

4. Given a program on the levels of questioning, you should be able to complete the program satisfactorily. Satisfactory performance is determined by your achievement of 90% on the competency measure at the end of the program. (First 3 weeks)

5. Given a list of objectives, you should be able to identify all those not stated in measureable performance terms and correct those not stated in performance terms. Appropriate performance will include identifying all the "wrong" objectives and making the appropriate corrections. (First 4 weeks)

Resources:

Systematic Instruction pp. 1-44

Developing Teacher Competencies chapter 2

Educational Objectives Filmstrip-tape available on class nights

6. Given a list of performance objectives, you should be able to (1) classify the objectives as cognitve, affective, or psychometor; and (2) label all cognitive objectives as high or low cognitive level. (First 4 weeks)

Resources:

Systematic Instruction Chapter 3

Developing Attitudes Toward Learning Chapter 3 & 4

Developing Children's Thinking Through Seience Chapter 2

Educational Objectives Filmstrip-tape

Identifying Affective Outcomes Filmstrip-tape

7. When given objectives and proposed evaluation procedure, you should be able to identify those procedures which are congruent with stated objectives. (continuous throughout the unit and lesson presentations)

Resources:

Developing Children's Thinking Through Science

Developing Teacher Competencies Chapter 5

8. PUT IT ALL TOGETHER! Given access to ESS materials, you should be able to present a unit (including representative objectives, lab activities, and proposed evaluation) appropriate for your grade level to a group of your peers.

Given the same materials and peer group, you should conduct a demonstration lesson to the peer group and to your students. Acceptable performance would include a 15 minute tape of the presentation in your classroom (hopefully, but not necessarily demonstrating that your objective was reached).

Last 7 Weeks

To accomplish this objective, you must:

1. Select a unit from the available materials at your grade level;

2. Prepare appropriate cognitive, affective, and psychomotor objectives for the unit (enough for the class);

3. Present objectives and activities in the unit to your peers (Make it easy on yourself and make them do science).

4. Prepare a one page lesson plan (examples will be provided) for a science activity in your classroom.

5. Propose a method of evaluation to demonstrate that your objective has been reached.

9. Given articles and questions relating to these articles dealing with contemporary issues such as motivation, accountability, learning difficulties, pros and cons of performance objectives, etc., you should be able to answer the questions orally in class.

PROGRESS CHECKLIST

SCIENCE PROCESS SKILLS

- X observing
- X classifying
- X measuring
- X communicating
- X inferring
- X identifying variables
- X predicting
- X constructing a table of data
- X constructing a graph
- X acquiring and processing your own data
- X describing the relationship between variables
- X analyzing investigations
- X defining variables operationally
- X constructing hypotheses
- X designing investigations
- ____ experimenting
- ____ Test A
- X Test B

PHILOSOPHY

- X paper

QUESTION ASKING SKILLS

- X program
- X written questions (lesson/practice)
- X competency measure

PERFORMANCE OBJECTIVES

- X identifying P.O.'s (TEST)
- X levels of P.O.'s (TEST)
- X unit objectives
- X lesson objectives

ESS UNIT PRESENTATIONS

- X presented unit
- X presented lesson (peer)
- X presented lesson (class)

ESS PARTICIPATION: (took part in)

- A-Games (twice)
- Kitchen Physics
- Mealworms
- Bones
- Optics
- Mobiles
- Colored Solutions
- Primary Balancing
- Mystery Powders
- Sand
- Clay boat

Evaluation

- ____ of student learning
- ____ of teacher effectiveness

FILMSTRIP TAPES

- X Educational Objectives
- X Systematic Instructional Decision Making
- X Selecting Appropriate Educational Objectives
- X Establishing Performance Standards
- X Identifying Affective Objectives
- X Teaching Units and Lesson Plans
- X Discipline in the Classroom

APPENDIX D

COMPILATION OF EVALUATIONS OF GRADUATE COURSE

Prof _____
Department Education
Course Number E548
Date _____

INDIANA UNIVERSITY
STUDENT EVALUATION OF INSTRUCTION

I. Evaluation of Instruction

Please carefully evaluate the effectiveness of the teacher of this course. Place an "X" in ONE of the blanks under each of the major categories. Comments may be extended to the other side of the sheet.

KNOWLEDGE OF SUBJECT MATTER
13 Exceedingly well informed
11 Adequately informed
___ Not well informed
___

Comment Intellectual

ATTITUDE TOWARD SUBJECT
23 Enthusiastic, enjoys teaching subject
___ Rather interested
___ Only routine interest displayed
___ Uninterested
___

Comment Really appreciate enthusiasm
The most I have ever experienced
Very excited about science
Helps inspire students, need more like him.

ABILITY TO EXPLAIN
12 Explanations clear and to the point
11 Explanations usually adequate
___ Explanations often inadequate
___ Explanations absent or totally inadequate
___

Comment

SPEAKING ABILITY
15 Voice and demeanor excellent
7 Adequate or average
___ Poor speaking distracting
___ Poor speaking a serious handicap
___

Comment

ATTITUDE TOWARD STUDENTS
19 Sympathetic, helpful, concerned
3 Usually helpful and sympathetic
___ Avoids individual contact, routine attitude
___ Distant, cold, aloof
___

Comment Empathetic
Excellent - always helpful

PERSONALITY
20 Attractive personality; I would like to know him better
3 Satisfactory personality
___ Not an outgoing personality
___ Personality conflict
___

Comment Tried to accommodate students individually.
Individual concern and hel was terrific and very much appreciated.

TOLERANCE TO DISAGREEMENT
20 Encourages and values reasonable disagreement
3 Accepts disagreement fairly well
___ Discourages disagreement
___ Dogmatic, intolerant of disagreement
___

He makes you more adamant
Comment Easy to relate with

Page 2. Student Evaluation

COMPARED TO ALL COLLEGE INSTRUCTORS YOU HAVE HAD, HOW WOULD YOU RATE THIS INSTRUCTOR AS A TEACHER?

10 Outstanding - very much so
12 Better than average
1 Average
___ Below Average
___ Poor

Comment One could go to him and discuss problems.

IF YOU COULD CHOOSE BETWEEN THIS INSTRUCTOR AND OTHERS IN A FURTHER COURSE, HOW WOULD YOU RATE YOUR PRESENT INSTRUCTOR?

12 Would prefer him/her to most teachers I have had at I.U.
6 Would be very pleased to have him/her again.
3 Would be satisfied to have him/her again.
___ Would rather not have him/her again.
___ Would not have him/her again under any circumstances.

II. EVALUATION OF COURSE

Please evaluate this particular section of this course.

ORGANIZATION OF THE COURSE
11 Well organized
8 Adequate, but could be better
3 Inadequate organization detracts
1 Confused and unsystematic

Comment Progress checklist let us know just what was expected of us.

ORGANIZATION OF DAILY LECTURES (OR CLASS WORK)
9 Well organized in meaningful sequence
6 Usually organized
5 Organization not too apparent
___ Little or no organization

Comment At beginning it was given an "unorganized" class- expected what I got and like it.

FREQUENCY OF TESTS
20 Right number, well times
___ Too infrequent
___ Too frequent
___ Timing should be improved

Comment Post-tests confusing We could take them when we were ready.
For the right reason, mastery is excellent.

CONTENT OF TESTS
19 Satisfactory
___ Too detailed
___ Not comprehensive enough
___ Wrong type of test for this course

Comment

OPPORTUNITY FOR QUESTION AND DISCUSSION
20 Ample opportunity
2 Occasional opportunity
1 Rare opportunity
___ Never

Comment

Page 3. Student Evaluation

ASSIGNMENTS

16 Assignments clear and reasonable
1 Clear but too long
5 Unclear - sometimes
___ Always unclear and unreasonable

Comment We know exactly what was expected from the first lesson on.

TEXTBOOKS

19 Textbooks good
2 Textbooks satisfactory
1 Use of text should be modified
___ Urge a different text altogether

Comment Not the usualy dry workbook texts. Very helpful.

WORK RELATED TO CLASS LEVEL

21 Work suited to class level
2 Attempt made to suit class level
___ Work completely above class level
___ Work completely below class level

Comment One could apply it to all class levels in elementary grades. Yes, Yes, Yes

ON THE REVERSE SIDE OF THIS SHEET PLEASE MAKE SUGGESTIONS FOR IMPROVING THIS COURSE.

Do not sign name. Please indicate class standing _____

Major Subject _____

Approximate accumulative average _____

Very gook class.
I'k like to take another science course with Dr. Funk. He is inspring at the end of a long hard day with students.